Applicant:
ESA Holding, Inc.
911 East Shannon Court
Venice, Florida 34293,
U.S.A.

Device and method for fixing at least one flexible fabric as well as housing rail for a filler section

Related applications

This application is a continuation of International Patent Application PCT/EP02/10965, which was filed on September 30, 2002 designating the U.S. and which was not published in English.

Technical field

The present invention relates to a device and a method for fixing at least one flexible fabric, in particular its rims, for achieving a permanent or temporary fixing as well as a housing rail for a filler section.

Prior Art

When outdoor surfaces, danger zones or spatial structures need to be protected, secured, covered or coated by means of flexible fabrics, e.g. tarpaulins, against weather, dangerous substances, loss of air or natural water, these elements of fabric and their rims are to be fixed accordingly and possibly to be sealed. In particular for temporarily arranged flexible fabrics it would be a big advantage, if these can be mounted and demounted in a fast and simple fashion without requiring any penetration or particular design of the rims. A general method of fixing consists in screwing flexible fabrics or their rims by means of listels to rigid surfaces or sections, which, however, involves penetration of the flexible fabric at short intervals. In the case of frequent mounting and demounting this requires an considerable work input and the perforation in the flexible fabric herein has to be constantly readjusted to precision. A disadvantage of fixed rim ends consists also in that these cannot be accurately readjusted without mechanical adaption, if due to the influence of weather expansions have already occurred in the fabric structures under tensile load in long-term employment.

It is the task of the present invention to provide a device and a method of the kind described initially, in which the rims of at least one flexible fabric can be fixed to resist tensile load to the places provided for this purpose without any rim or fixing holes being provided.

Advantages of the invention

This task is solved by a device with the features of patent claim 1 and a method with the features of patent claim 5. A housing rail particularly suited to be employed with the device and the method according to the invention is claimed in patent claim 6.

Flexible fabrics in the sense of the invention are to be understood as flexible, essentially two-dimensional structures, e.g. tarpaulins, grid fabrics, textiles, canvasses, mats, foils, grid tarpaulins, grid foils and ribbon foils.

In a solution according to the invention a rail, preferably with U-shaped cross section, serves as housing for one or for several rims of flexible fabrics. This housing rail according to the constructive requirements given can be embedded and anchored permanently in the ground but also be fixed above ground to spatial structures in all geometric directions. Another possibility is free resting on the ground, in order to serve as simple coupling device for several flexible fabrics. The actual fixing of the flexible fabric is then effected by a deformable filler section which together with one or several fabric rims is pressed into the rail. The filler section may be of random cross section, in particular of round, oval, square, hexagonal cross section. For a choice of material random plastic materials may be considered, e.g. rubber, plastics, textiles etc.. The filler section is designed as full section, e.g. as rubber bead. In the latter case, a filling with a filler material may be considered. Materials with high density are preferably used as filler materials, e.g. sand, water, gravel and/or soil. As particularly a round rubber section has the property of resuming its manufactured shape in the absence of pressure, this filler element in particular in its changed or squeezed form causes or ensures a strong and permanent lateral pressure upon the fabric which is adjacent to the inner surfaces of the two arms of the rail.

When using a tarpaulin in this way complete tightness can be achieved already. If an increased tensile strength of the connection is to be secured in addition or for the

employment of different fabrics, e.g. grid fabrics, the housing rail is turned and arranged in such a way that the fabric side under tensile load is markedly redirected. Marked redirection in the sense of the invention is to be understood particularly as a change of direction of the fabric by more than 90°. Since the direction of the tension of the fabric thus does not correspond to the mounting direction of the clamping filler section, a very large resistance forms at the edge of the arm due to redirecting the fabric, the resistance counteracting the lifting of the filler section from the housing rail.

For particularly high requirements on the tensile properties of the fabric fixing the two inner surfaces of the arms of the housing rail are designed to exhibit beads at their very tops, the beads acting as further functional brake for the already pressed in filler section. The simple and fast dismantling of the connection is effected by removing the filler section at an angle from the housing rail starting from the end of the rail as well as in the opposite sense of the direction of insertion.

In a preferred embodiment the housing rail has at least one external rib for supporting a fixing of the rail below ground or for being employed in a rail mounting above ground.

The invention is preferably applied in the sealing of an air-borne hall, for mounting protection devices against hurricanes and high tides.

Drawings

An embodiment of the invention is shown as an example in the following drawings showing:

Fig. 1
cross section of a housing rail embedded in the ground with a piece of fabric freely resting thereon and a round filler section on top;

Fig. 2
cross section of a housing rail embedded in the ground with a pressed in fabric rim and a filler section which already has adapted the shape of its section;

Fig. 3
cross section of a housing rail embedded in the ground with two pressed in fabric rims and a filler section;

Fig. 4
cross section of a fabric fixing in the case of a rigid wall, the function of tightness being required;

Fig. 5
cross section of a fabric fixing under tensile load to a constructive structure, wherein the arms of the housing rail are designed to form brake beads on their inner surfaces and the fabric side under tensile load is markedly redirected;

Fig. 6
cross section of a fabric fixing in the case of an air-borne hall, wherein the sealing flap not under tensile load and facing towards the inside is connected in an air-tight fashion with the housing rail;

Fig. 7
schematic view of an air-borne hall with an external rope structure in which the fabric rim positioned inside is rolled up with ballast bags to form a bead;

Fig. 8
interior view of a fabric fixing in the case of an air-borne hall with external rope structure, wherein a fabric tape which is not under tensile load is connected with the housing rail and the filler section which is to be rolled up with the cover rim facing the inside and ballast bags to form a bead;

Fig. 9
schematic view of the array of ground anchor, housing rail, filler section and fabric rim in preparation of the subsequent mounting of an air-borne hall;

Fig. 10

the structure of Fig. 9 with inflated air-borne hall and air-borne hall held by the ground anchor;

Fig. 11
the structure of Fig. 10 with the sealing bead completely rolled up; and

Fig. 12
enlarged view of a cross section in an example of a particularly preferred embodiment of a housing rail according to the invention.

Description of the exemplary embodiments

Figure 1 shows the fixing of a fabric rim prior to the actual connecting of all essential components: housing rail 1 embedded in the ground with external ribs 5 arranged for a stable anchoring, a fabric rim 3 lying straight and the round filler section 2 as well as bead 6 as additional securing device against tensile load of the filler section 2. In a preferred embodiment the filler section consists of full rubber with an essentially circular cross section. The diameter of the filler section has a size of preferably 10 to 50 mm, even more preferably of 20 to 40 mm, also for other cross sections.

Figure 2 shows the fabric fixing with the pressed in filler section 2 already adapted in shape and the fabric rim 3 markedly redirected towards the outside.

Figure 3 shows a fabric fixing in which two fabric rims 3 and 4 are fixed by the filler profile 2 and sealed capable of bearing tensile load.

Figure 4 shows a modified housing rail 1 with a securing bead 6 arranged laterally on a wall 7 fixed via the unilateral external rib 5 to a ground base 8 as well as the fabric rim 3 adjacent to the wall 7 with the filler profile 2.

Figure 5 shows a modified housing rail 1 laterally fixed via the external ribs 5 to a hollow section 9, the clamped and markedly redirected fabric rim 3 and the filler profile 2.

Figure 6 shows a downscaled view of an air-borne hall 10 as well as a detailed view of the rim connection of the air-borne hall 10 in which a circumferential tube frame 13 absorbs the tensile forces of the cover 10 from the tarpaulin fabric loop 11 and dissipates them via ropes 14 and ground anchors 15 into the construction ground. The short fabric rim 3 facing towards the inside, in the present case a so-called sealing flap lying freely on the ground within the air-borne hall, is fixed and sealed by the housing rail 1 and the filler section 2.

Figure 7 is a schematic view of an air-borne hall with a cover 16 and a rope structure 18 in which the static forces are dissipated via ground anchors 15 into the construction ground. The sealing is effected by a bead 20 in which the cover rim facing towards the inside is rolled up with sealing bags.

Fig. 8 shows the cover 16 with the external rope structure 18 which is connected to the ground anchors 15. The housing rail 1 with its external ribs 5 is embedded in the ground. The circumferential fabric tape 3 is fixed and sealed by the filler section 2. Upon the tarpaulin fabric rim 16 of the cover facing towards the inside rests a sealing bag 17 by means of which the two rims of the fabric 3 and 16 are rolled up together towards the edge of the hall and sealed off against the outside.

Figure 9 shows the housing rail 1 with the fabric tape 3, the filler profile 2 and the ground anchor 15. This is the preparation for the subsequent mounting of an air-borne hall with an external rope structure.

Figure 10 shows the already inflated air-borne hall with the cover 16, rope structure 18, shackle 19 and the ground anchor 15. A sealing bag 17 is placed on the cover rim 16 facing towards the inside. The pre-mounted fabric tape 3 is located underneath.

Figure 11 shows the completely rolled-up sealing bead 20 consisting of the fixed and sealed fabric tape 3, the cover rim 16 and the inner sealing bag 17.

Figure 12 shows a cross section in a particularly preferred embodiment of a housing rail 1 according to the invention. A bottom support 21 at the inner surface is of round

design and supports the filler section 2 which is drawn in a broken line from below. This ensures that the filler profile cannot swerve into any cavities, but is clamped in the ideal shape. For other cross sections of the filler section 2 designs of the support 21 adapted thereto are preferred. The housing rail 1 exhibits two bottom ribs 22 facilitating an improved connection to uneven surfaces which are not very hard. A centring groove 23 serves as centring aid for the drilling of through apertures for the fixing screws one of which is equally drawn in broken line as a clarifying example. Thereby in certain applications it is rendered possible to do without the external ribs. The two centring grooves 24 equally serve as drilling aids allowing for the lateral fixing of brackets, flat sections and alike, so as to facilitate thereby, e.g. in applications in connection with hurricane protection, the fixing of support ropes or the securing against being lifted, particularly in the case of soft ground. Support ropes are preferably used between two housing rails arranged in parallel for the purpose of supporting the fabric and reducing the tensile load on the clamping connection between housing rail, fabric and filler section. Alternatively, drillings in the area of the centring grooves 24 can also be used for coupling several housing rails 1 with each other. A cavity 25 preferably having an essentially oblong cross section, e.g. serves for insertion of couplings made of flat section for coupling of several housing rails 1 with each other. However, it also is suited as clearance for the heads of the fixing screws and rivets and as housing for the dirt falling into the housing rail 1, so that a clamping of the filler section 2 is not obstructed.

The housing rail 1 is preferably manufactured of aluminium.